

REMARKS

Claims 20, 36-37 and 108-134 are pending. Claim 20 has been amended to recite a temperature range of about 23 °C to about 40 °C. Support for this amendment is found, for example, in original claim 36, and at page 39, line 3 of the specification. The preamble of claim 20 has been amended to recite “A process for preparing 2-C-methyl-D-ribonolactone comprising:” Support for this amendment is found, for example, in original claim 22.

Claim 32 has been canceled. Applicants respectfully request reconsideration of the pending rejections based on the following remarks.

Interview Summary

Applicants thank Examiners Ganapathy Krishnan and Shaojia A. Jiang for the in-person interview of February 12, 2009 with Applicants’ representative Dale L. Rieger. The rejection under 35 U.S.C. § 103(a) was discussed. Applicants pointed out that the Declaration of Moussa and the data provided therein demonstrates a 30 to 36% improvement in product yield over the prior art process, and that this surprising result renders the instant claims patentable over BeMiller, the prior art process cited by the Office. Examiner Jiang stated that she would reconsider the rejection of claim 20 if Applicants agreed to specify a temperature range of 23 °C to 40 °C in the claim. Applicants agreed to do so. Examiner Jiang also asked that Applicants amend the preamble of claim 20 to recite, “A process for preparing 2-C-methyl-D-ribonolactone comprising:” Applicants agreed to do so.

Claims Rejections under 35 U.S.C. § 103

The Examiner has maintained the rejection of the instant claims under 35 U.S.C. § 103(a) as allegedly obvious over BeMiller, in view of Merck, Ault, Sundberg, McFarlin and Piccirilli. (Office Action, page 3). Specifically, the Examiner alleges that the data provided in the Declaration of Adel Moussa “is not seen as an unexpected result” because a reaction time of 22-26 hours is “comparable to that reported by BeMiller” and a 3% increase in yield is not “a substantial improvement in the yield of the product.” (Office Action, page 6). Applicants respectfully disagree.

First, Applicants reassert that it would not have been *prima facie* obvious to arrive at the process of the instant claims via the combined teachings of BeMiller, Merck, Ault, Sundberg, McFarlin and Piccirilli as the Examiner alleges. But even if it had, one of ordinary skill in the art, at the time of the invention, would not have expected that these modifications would provide a process suitable for the large-scale production of 2-C-methyl-D-ribonolactone. Applicants point out that the process of the instant claims is useful as an improved method for the large-scale production of the product, 2-C-methyl-D-ribonolactone. (Specification, page 13; Declaration of Moussa, ¶ 14) The prior art does not teach a process suitable for the large-scale production of this product, as the prior art processes, including that of BeMiller, require reaction times and purification procedures impracticable for large-scale production. (*Id.*)

Both the instant specification and the Declaration of Adel Moussa, explain that the process of the instant claims surprisingly provided higher product yields, significantly shorter reaction times over the BeMiller process, and improved ease of purification. (Specification, page 13, lines 9-15 and page 29, lines 5-8; Declaration of Moussa, ¶¶ 11 to 14). For these reasons, and as discussed further below, Applicants have rebutted any *prima facie* case of obviousness the Examiner may have made.

1. Improved Product Yields

The process of the instant claims provides a surprising and unexpected increase in the yield of 2-C-methyl-D-ribonolactone over the process of BeMiller. The BeMiller process provides an approximate 10% product yield, while the process of the instant claims provides 13-13.6% product yields, as shown in the Declaration of Adel Moussa at ¶ 9. It is alleged in the Office Action that the process of the instant claims “has not produced a substantial improvement in the yield of the product.” (Office Action, page 6). However, as discussed in the Declaration of Adel Moussa, the process of claim 20 provides a 30 to 36% improvement in product yield over the process of BeMiller— a substantial improvement for large-scale production. (Declaration of Moussa, ¶¶ 11 and 14). Applicants point out that the question is not whether the improved product yield is substantial, but rather whether one of ordinary skill in the art, *a priori*, would have expected such an improvement in yield based on the prior art process described in BeMiller. Respectfully, the answer is no. (Declaration of Moussa, ¶¶ 11 and 14). Additional evidence of the unpredictability of the claimed calcium oxide/D-fructose process is the fact that a significant reduction in yield occurs the molar ratio of calcium oxide to D-fructose strays outside the range of instant claim 20.

(Declaration of Moussa, ¶ 9). Indeed, while molar ratios of about 4 to 1, 2 to 1, to about 1.5 to 1 of CaO to D-fructose provided product yields of 13 to 13.6%, ratios of 8 to 1, 1 to 1 and 0.75 to 1 gave significantly lower yields. (*Id.*). Simply put, one of ordinary skill in the art, reading BeMiller, would not have expected that the process of claim 20—with its specific reagent ratios—would provide such an increase in product yield.

In view of these unexpected results, which provide a significantly improved method for the large-scale production of 2-C-methyl-D-ribonolactone through improved product yields, instant claim 20, and claims 32, 36-37 and 108-132 which depend from claim 20, are not obvious. *See In re May*, 574 F.2d 1082, 1094 (C.C.P.A. 1978) (unexpected results can rebut a *prima facie* case of obviousness). Therefore, Applicants respectfully request that the rejection under 35 U.S.C. § 103(a) be withdrawn.

2. Purification Amenable to Large-Scale Production

The Examiner alleges that Ault teaches the purification techniques of the instant claims, and that “Applicants have not shown that the product of BeMiller obtained before ion exchange purification is not as good as the instant product via side by side comparison.” (Office Action, page 6). Applicants point out that, while Ault generally teaches purification steps similar to those of instant claim 36, Ault provides no indication that the specific purification steps of the claim 36 would provide 2-C-methyl-D-ribonolactone in sufficient purity. Ault certainly does not provide any guidance as to whether the instant process would be amenable to large-scale production. Indeed, Applicants surprisingly discovered, through experimentation, that the process of the instant claims provides a product that is easier to purify, as compared to the BeMiller process. This is evidenced by the experimental data provided in the Declaration of Adel Moussa, wherein extraction, filtration and precipitation steps provide product of sufficient purity for further use. (Declaration of Moussa, ¶¶ 8 and 9). BeMiller teaches purification of the product using an ion exchange column, which one of ordinary skill in the art would recognize as not practicable and prohibitively expensive for large scale syntheses and commercial production. (Declaration of Moussa, ¶ 13). Applicants disagree with the Examiner’s assertion that they must show that the product of BeMiller obtained before ion exchange purification is not as good as the instant product. One of ordinary skill in the art would not assume that the BeMiller process would lead to a pure product without performing each step taught by BeMiller— including ion exchange chromatography. In fact, BeMiller teaches away from the instant process because the instant

process does not utilize such extensive purification methods. *See In re Peterson*, 315 F.3d 1325, 1331 (Fed. Cir. 2003) (applicant may rebut a *prima facie* case of obviousness by showing that the prior art teaches away from the claimed invention in any material respect). In other words, one of ordinary skill in the art would not expect that 2-C-methyl-D-ribonolactone of adequate purity would be available by the simplified purification steps of instant claim 36. This surprising improvement discovered by the inventors renders claim 36, and claims 37 and 108-132 which depend from claim 36, nonobvious over the art cited by the Examiner.

3. Significantly Shortened Reaction Time

The Examiner alleges that reaction time of the process of the instant claims, which is from about 20.5 to 26.5 hours, is “comparable to that reported by BeMiller.” (Office Action, page 6). Applicants respectfully point out that, in stark contrast to process of claim 37, the BeMiller process requires 6 to 8 weeks. Thus, as the Declaration of Adel Moussa explains, the inventors’ forty-fold improvement in reaction time over the BeMiller process is not only completely unexpected, but results in a practicable process for the large-scale production of the desired product. (Declaration of Moussa, ¶¶ 12 and 14). Without such an improvement, large scale production of the product would be cost and time prohibitive due to BeMiller’s teaching of reaction times on the order of weeks. Indeed, although the process of BeMiller was published in 1960, the Examiner has provided no evidence that the BeMiller process was ever used for the large scale production of the commercially useful product, 2-C-methyl-D-ribonolactone. Applicants point out that this is due in part to the extremely impractical and cost prohibitive reaction time of the BeMiller process. The surprising improvement in reaction time discovered by the inventors renders claim 37, and claims 119-122 and 134, nonobvious over the art cited by the Examiner. *See In re May*, 574 F.2d at 1094. For the above reasons, Applicants respectfully request that the rejections under 35 U.S.C. § 103(a) be withdrawn.

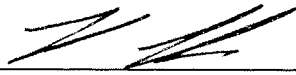
CONCLUSION

In view of the foregoing, it is submitted that this application is in condition for allowance. Favorable consideration and prompt allowance of the application are respectfully requested. If the Examiner believes it would be useful to advance prosecution, the Examiner is invited to telephone the undersigned at (858) 314-1200.

A fee for an extension of time of two months will be paid by EFS Web. Please apply any additional fees and any other charges, or any credits, to Jones Day Deposit Account No. 503013 (ref. no. 417451-999027).

Respectfully submitted,

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